WHAT IS CLAIMED IS:

1. A switchable organic photodetector capable of producing a photocurrent in response to light impinging thereupon comprising a photodiode and a variable voltage source,

said photodiode having a built-in potential and comprising:

a first electrode;

a photoactive organic layer disposed on said first electrode; and

a second electrode disposed on said photoactive organic layer; and

said voltage source adapted to selectively apply a switching voltage across said first electrode and said second electrode, said switching voltage imparting a photosensitivity above 1 mA/W at a preselected operating bias and near-zero photosensitivity at a cut-off bias substantially equivalent in magnitude to said built-in potential.

2. A photodiode detector of claim 1 wherein the operating bias is an operating reverse bias.

3. A photodiode detector of claim 1 wherein the operating bias is an operating forward bias.

4. A read-out circuit comprising an organic photodiode detector of claim 1 and means for detecting the photocurrent, wherein the operating bias is in the range of 1-15 V and represents an ON state of the photodiode, said detector having a photosensitivity above 1 mA/Watt in said ON state, and wherein the cut-off bias represents an OFF state of the photodiode equivalent to zero photoresponse at an output of the read-out circuit.

5. The read out circuit of claim 4 wherein the ON and OFF states provide a digital read out.

6. A photodiode array comprising a plurality of photodiode detectors of claim 1 said detectors having their photodiodes arranged in an array, each of said photodiodes being selectively addressable as a pixel of said array.

7. The photodiode array of claim 6, wherein said array comprises at least one row of photodiodes and at least one column of photodiodes, each row having associated therewith a common anode, each column having associated therewith a common cathode, the first electrode of each photodiode of a row being connected to said common anode, the second electrode of each photodiode of a column being connected to said common cathode, said voltage source adapted to apply said switching voltage across at least one common anode and at least one common cathode to thereby selectively activate at least one pixel of said array.

8. The photodiode array of claim 7, comprising means for applying said switching voltage across a plurality of common anodes and at least one common cathode to thereby selectively activate at least one column of pixels of said array.

9. The photodiode array of claim 7, comprising means for applying said switching voltage across a plurality of common cathodes and at least one common anode to thereby selectively activate at least one row of pixels of said array.

10. A scannable array of voltage-switchable organic photodiodes each having a built-in potential and a predetermined photosensitivity range, said array comprising:

a support substrate;

a first electrode layer comprising at least one linear electrode disposed on said support substrate along a first direction;

a photoactive organic layer disposed on said linear electrode;

a second electrode layer comprising a plurality of linear electrodes disposed on said photoactive layer along a second direction transverse to said first direction; and

a voltage source adapted to apply a switching voltage across at least one electrode of said first electrode layer and at least one electrode of said second electrode layer, said switching voltage thereby imparting to at least one selected photodiode a photosensitivity above 1 mA/W at an operating reverse bias and near-zero photosensitivity at a cut-off bias substantially equivalent in magnitude to said built-in potential.

11. A method of selectively detecting light incident on an array of voltage-switchable organic photodiode detectors, said array comprising a plurality of photodiodes arranged in a row and column matrix, each photodiode having a built in potential and adapted to generate an output in response to incident radiation, each photodiode comprising a first electrode, a photoactive organic layer disposed on said first electrode, and a second electrode disposed on said photoactive layer, the first electrode of each photodiode in a row being electrically connected to a common anode, the second electrode of each photodiode in a column being electrically connected to a common cathode, said method comprising:

sequentially activating a selected column of photodiodes by;

applying an operating bias voltage across the common cathode associated with said selected column and all the common anodes, said operating bias voltage imparting to each photodiode of the selected column a photosensitivity above 1mA/W;

applying a cut-off voltage across remaining cathodes and all the anodes, said cut-off voltage being equivalent in magnitude to said built-in potential and imparting to the photodiodes of all columns other than the selected column near-zero photosensitivity; and

sequentially reading out the generated output of the selected column of photodiodes.

12. A method of selectively detecting light incident on an array of voltage-switchable organic photodiode detectors, said array comprising a plurality of photodiodes arranged in a row and column matrix, each photodiode having a built in potential and adapted to generate an output in response to incident radiation, each photodiode comprising a first electrode, a photoactive organic layer disposed on said first electrode, and a second electrode disposed on said photoactive layer, the first electrode of each photodiode in a row being electrically connected to a common anode, the second electrode of each photodiode in a column being electrically connected to a common cathode, said method comprising:

sequentially activating a selected row of photodiodes by;

applying an operating bias voltage across the common anode associated with said selected row and all the common cathodes, said operating bias voltage imparting to each photodiode of the selected row a photosensitivity above 1mA/W;

applying a cut-off voltage across remaining anodes and all the cathodes, said cut-off voltage being equivalent in magnitude to said built-in potential and imparting to the photodiodes of all rows other than the selected row near-zero photosensitivity; and

sequentially reading out the generated output of the selected row of photodiodes.

13. An organic photodiode detector comprising a photodiode and a voltage source, said photodiode having a built-in potential and a prescribed photosensitivity range in response to incident radiation, said photodiode comprising:

a first electrode;

a photoactive organic layer disposed on said first electrode;

a second electrode disposed on said photoactive organic layer; and

said voltage source adapted to apply an operating biasing voltage across said first electrode and said second electrode, said biasing voltage operating to vary said prescribed photosensitivity range.

14. The organic photodiode detector of claim 13, wherein the photosensitivity of said photodiode is above 1mA/W at an operating bias of said voltage source and is at a near-zero level at a cut-off bias substantially equivalent in magnitude to said built-in potential, said voltage source being switchable between said operating bias and said cut-off bias.

15. The organic photodiode detector of claim 13, additionally comprising a support substrate upon which the first electrode is disposed wherein said support substrate and said first electrode are substantially transparent to the incident radiation.

16. The organic photodiode detector of claim 13, wherein said photoactive organic layer is comprised of a semiconducting conjugated polymer.

17. The organic photodiode detector of claim 16, wherein said semiconducting conjugated polymer is selected from:

poly(phenylenevinylene), and its derivatives;
polythiophene, and its derivatives;
poly(thiophene vinylene), and its derivatives;
polyacetylene, and its derivatives;
polyisothianaphene, and its derivatives;
polypyrrole, and its derivative;
poly(2,5-thienylenevinylene), and its derivatives;
poly(p-phenylene), and its derivatives;
polyflourene, and its derivatives;
polycarbazole, and its derivatives;
poly(1,6-heptadiyne), and its derivatives;
polyquinolene, and its derivatives; and
polyaniline, and its derivatives.

18. The organic photodiode detector of claim 16, wherein said semiconducting conjugated polymer is the donor of a donor/acceptor polyblend,

said acceptor being selected from poly(cyanophenylene vinylene), fullerene molecules including C_{60} and functional derivates thereof, PCBM and PCBCR.

19. The organic photodiode detector of claim 16 wherein said semiconducting conjugated polymer is the donor of a donor/acceptor polyblend, said acceptor being selected from an organic photoreceptor molecule or an electron transport molecule.

20. The organic photodiode detector of claim 13, wherein said photoactive organic layer comprises a material selected from a polymer/polymer polyblend, a polymer/(organic molecule) polyblend, and organic molecules, organometallic molecules, oligomers or molecular blends selected from:

anthracene and its derivatives,
tetracene and its derivatives,
phthalocyanine and its derivatives,
pinacyanol and its derivatives,
fullerene C_{60} and its derivatives,
thiophene and its derivatives,
phenylene and its derivatives,
oxadiazole and its derivatives,
PBD and its derivatives,
Alq_3 and other metal-chelate ($M\text{-}L_3$) type organometallic molecules,
$6T/C_{60}$ and blends comprising their derivatives,
6T/pinacyanol and blends comprising their derivatives,
phthalocyanine/o-chloranil and blends comprising their derivatives,
anthracene/C_{60} and blends comprising their derivatives, and
anthracene/o-chloranil and blends comprising their derivatives.

21. The organic photodiode detector of claim 13, wherein said photoactive organic layer is arranged in a semiconducting heterojunction structure having at least one set of donor and acceptor regions disposed therein.

22. The organic photodiode detector of claim 13, wherein said photoactive organic layer comprises optically inert organic additives and/or optically inert inorganic nanoparticles.

23. The organic photodiode detector of claim 13, wherein at least one of said first and second electrodes comprises conducting polymer.

24 The organic photodiode detector of claim 13, additionally comprising an optical filter layer adapted to restrict transmission of incident radiation to a predetermined wavelength range.

25. The organic photodiode detector of claim 24, wherein the predetermined wavelength range is selected to permit a spectral response which follows that of the human eye.

26. A photodiode array comprising a pluraty of photodiode detectors of claim 13, said detectors having thereon photodiode arranged in an array, each of said photodiodes being selectively addressable as a pixel of said array which said pixels including pixels for detecting radiation in the red range, pixels for detecting radiation in the green range, and pixels for detecting radiation in the blue range.

27. The organic photodiode detector of claim 13, additionally comprising a scintillating over layer, said scintillation over layer emitting photons in response to incident high energy ionized particles, said photons being detected by the organic photodetector.

28. The organic photodiode detector of claim 27, wherein said ionized particles are selected from high energy photons, electrons, characteristic of X-rays, beta particles and gamma radiation.

29. The organic photodiode detector of claim 13, additionally comprising an organic sensing layer that generates mobile electrons and holes in response to incident high energy ionized particles.

30. The scannable array of claim 10, wherein the support substrate is made of insulating or semiconducting material and embedded with integrated driving and readout circuits.

31. The scannable array of claim 30, wherein the integrated driving circuit comprises a column or row selection circuit.

32. The scannable array of claim 30, wherein the readout circuit comprises current integrators or current-voltage converters.

33. The photodiode array of claim 7, additionally comprising a coating of black matrix in the space between the pixels.

34. The organic photodetector of claim 13, additionally comprising an optical mirror placed to form a microcavity optical etalon device which possesses selective response at resonant wavelengths.

35. The organic photodetector of claim 13, additionally comprising two optical mirrors placed outside to form a microcavity device (optical etalon) which possesses selective response at resonant wavelengths.

36. The organic photodetector of claim 13, wherein a buffer layer is inserted between an electrode and the photoactive organic layer.

37. The organic photodetector arrays of claim 7, wherein the switching voltage varies among pixels so that inhomogeneity of photosensitivity can be compensated with external bias.

38. The organic photodetector array of claim 7, wherein the switching voltage varies among pixels following a defined pattern so that a sensing array with designed photosensitivity pattern is achieved for specific applications such as image procession.

5